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ANALYSIS OF THE ANTINUTRIENTS LEVELS IN STAPLE FOOD CROPS IN THREE DIFFERENT LOCAL GOVERNMENT AREAS OF EBONYI STATE, NIGERIA

Offor, C.E., Nweke, F. N., Okaka, A. N. C., Igwenyi, I. O. and Onwe, V.N.
Department of Biochemistry/Biotechnology, Ebonyi State University, Abakaliki.

ABSTRACT
The antinutrients levels in staple food crops (cassava, yam and potato) from Izzi, Ezza and Ikwo Local Government Areas of Ebonyi state were determined using titrimetric and spectrophotometric methods. The antinutrients levels (mg/100ml) in cassava from Izzi recorded saponins (0.03 ± 0.01), tannins (5.25 ±0.10), phenols (0.04 ± 0.01), oxalates (0.47 ± 0.02), alkaloids (0.04 ± 0.04), and cyanogenic glycosides (0.26 ± 0.01); Ezza recorded saponins (0.04 ± 0.01), tannins (6.40 ± 0.10), phenols (0.16 ± 0.10), oxalates (0.43 ± 0.01), alkaloids (0.35 ± 0.02) and cyanogenic glycosides (0.02 ± 0.02). The cassava from Ikwo had saponins (0.06 ± 0.01), tannins (2.40 ± 0.10), phenols (0.06 ± 0.02), oxalates (0.08 ± 0.04), alkaloids (0.08 ± 0.02), and cyanogenic glycosides (0.0.2 ± 0.02). The concentrations of these antinutrients in yam from Izzi were 0.08 ± 0.03, 2.81. ± 0.17, 0.54 ± 0.04, 0.46 ± 0.04, 0.18 ± 0. 05 and 0.15 ± 0.10 for saponins, tannins, phenols, oxalates, alkaloids and cyanogenic glycosides respectively with corresponding values of 0.07 ± 0.06, 2. 10 ± 0.01, 0.37 ± 0.03, 0.81 ± 0.03, 0.74 ± 0.10 and 0.25 ± 0.10 for Ezza yam. The yam from Ikwo gave the following values: saponins (0.05 ± 0.01), tannins (10.2 ± 1.08), phenols (0.04 ± 0.04), oxalates (0.57 ± 0.06), alkaloids (0.27 ± 0.10), and cyanogenic glycosides (0.22 ± 0.10). Similarly, the concentrations of tannin, phenol, oxalate and alkaloid obtained in potatoes from these localities were as follows; Izzi 7.4 ± 0.03, 0.23 ± 0.01, 0.07, ± 0.04 and 0.96 ± 0.10; Ezza 6.30 ± 0.04, 0.08 ± 0.01, 0.03 ± 0.02 and 0.42 ± 0.10; Ikwo 5.1 ± 0.20, 0.06 ± 0.02, 0.17 ± 0.10 and 0.37 ± 0.02 respectively. Saponins and cyanogenic glycosides were absent in potato. The results depicted substantial variation in concentrations of the antinutrients in food crops from these localities.

KEYWORDS: Antinutrients, Staple food crops, Three Local Government, Ebonyi State.

INTRODUCTION

Antinutrients are chemical substances that are inherent in staple food crops. These substances antagonize and reduce the nutritional value of food interfering with mineral bioavailability and digestibility of essential nutrients thereby making them unavailable for the cells when consumed (Ames *et al.*, 1990). Also, foods refer to or could be defined as complex mixture of chemicals and often contain compounds that are potentially harmful as well as those that are beneficial. Certain nutritional inhibitors and toxic substances are associated with foodstuffs. These nutritional inhibitors are called anti-nutritional factors. These factors are defined as those nutrients that are naturally present in the food and some are due to contamination, which may be of fungal origin or related to soil and other environmental influences (Holloway and Bradbury, 1999).

These factors modify the nutritional value of some staple foods and have very serious consequences on health of people that consume them. For instance the ingestion of unprocessed food (cassava) based diet causes reduced growth rate in rats, and other ruminant animals (Hammond *et al*., 1996). Also the consumption of oxalate causes stone formation in the urinary tract. Cyanogenic glycosides, which are found in cassava, produce hydrogen cyanide on hydrolysis. This, when consumed, is converted to thiocyanate which can interfere with iodine metabolism giving rise to goiter and cretinism (Ames *et al*., 1990). Potato contains solanine and chaconine which are more concentrated in the aerial part of the plant and the peel.

In addition to the hazards posed by natural toxins that are intrinsic feature of their composition, foods may also act as the isle by which an exogenous harmful agent may be consumed. Other antinutrients such as phenols and phytates may play beneficial roles in human diets by acting as anti-carcinogens or by promoting health in other ways such as decreasing the risk of heart disease or diabetes (Holloway and Bradbury, 1999).

Most of the antinutrients found in food crops can be reduced by post harvest processing. There are many proteinase inhibitors that are denatured easily by heating (Osagie, 1998). Oxalic acid when consumed in large quantities causes gastroenteritic shock, convulsive symptoms and renal damage. These effects can be reduced through post harvest processing. However, oxalates play a very important role in limiting the availability of some elements like calcium, manganese and phosphorus in the food crops. The levels of poisonous alkaloids and steroids are reduced through processing method (Pearson, 1994).The objective of this study was to determine the antinutrients levels in staple food crops from three different local Government Areas of Ebonyi State.

MATERIALS AND METHODS

Materials: Different varieties of cassava, yam and potato were gotten from Izzi, Ezza and Ikwo Local Government Areas of Ebonyi State in November, 2007.

METHODS

Titrimetric methods of Harbone (1983) were used for quantitative determination of tannins and cyanogenic glycosides while spectrophotometric methods of Association of Analytical Chemists (AOAC) (1989) were used for quantitative determination of saponins, alkaloids, oxalates and phenols.

RESULTS

The mean concentrations of antinutrients (mg/100ml) in food crops from the three different areas are shown in Table 1.

Table 1: Mean concentrations of antinutrients (mg/100ml) in food crops from the three different Local Government Areas of Ebonyi State, Nigeria.

Food crops	L.G. Areas	Saponin	Tannin	Phenol	Oxalate	Alkaloid	Cyanogenic glycoside
Cassava	Izzi	0.03 ± 0.01	5.25±0.10	0.04±0.01	0.47±0.02	0.04± 0.04	0.26 ± 0.01
	Ezza	0.04 ± 0.01	6.40± 0.10	0.16± 0.10	0.43±0.01	0.35± 0.02	0.02 ± 0.02
	Ikwo	0.06 ± 0.01	2.40± 0.10	0.06± 0.02	0.08±0.04	0.08± 0.02	0.02 ± 0.02
Yam	Izzi	0.08 ± 0.03	2.81± 0.17	0.54± 0.04	0.46±0.04	0.18± 0.05	0.15 ± 0.10
	Ezza	0.07± 0.06	2.10± 0.01	0.37± 0.03	0.81±0.03	0.74± 0.10	0.25 ± 0.10
	Ikwo	0.05 ± 0.01	10.2± 1.80	0.04± 0.04	0.57±0.06	0.27± 0.10	0.22 ± 0.10
Potatoes	Izzi	0.00 ± 0.00	7.40± 0.03	0.23± 0.01	0.07±0.04	0.96± 0.10	0.00 ± 0.00
	Ezza	0.00 ± 0.00	6.30± 0.04	0.08± 0.01	0.03±0.02	0.42± 0.10	0.00 ± 0.00
	Ikwo	0.00 ± 0.00	5.10± 0.20	0.06± 0.02	0.17±0.10	0.37± 0.02	0.00 ± 0.00

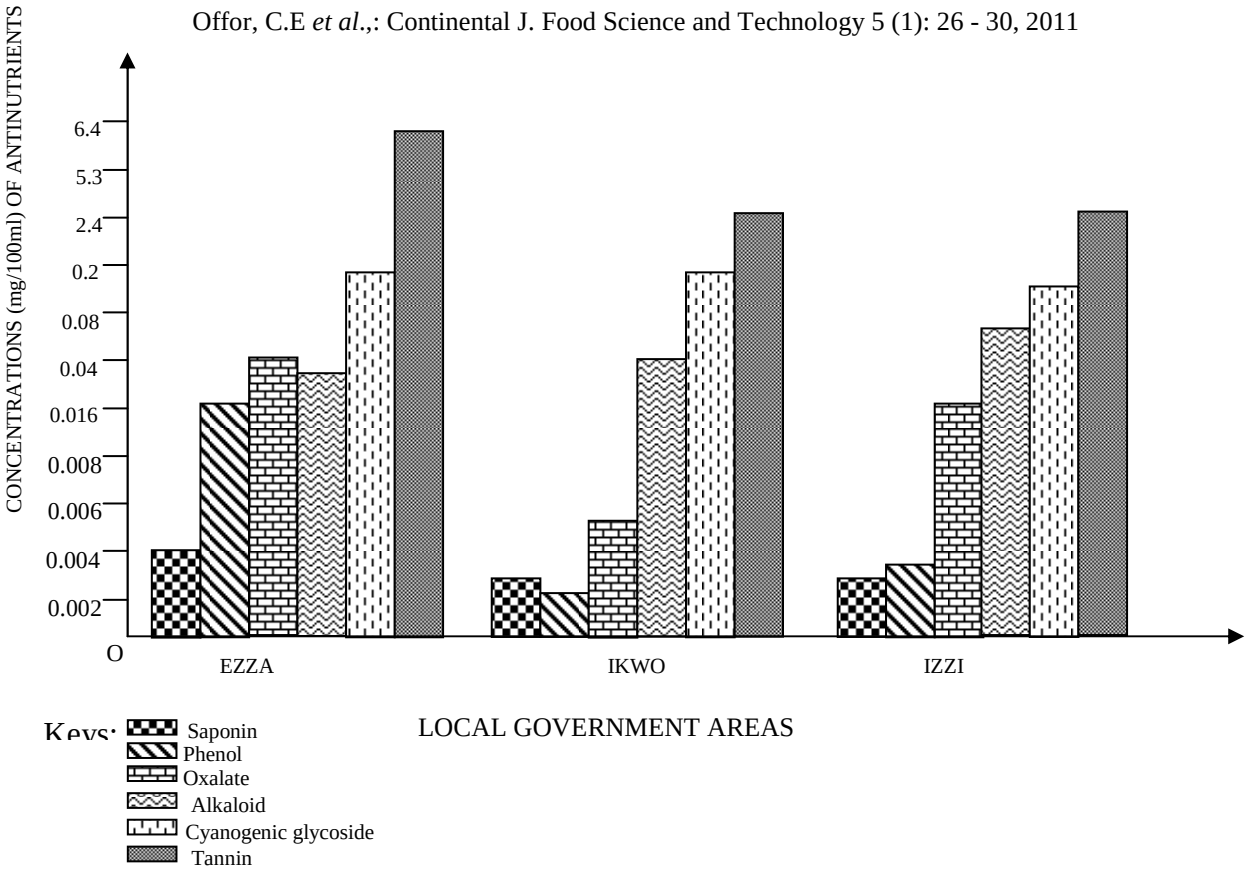

Fig. 1: Bar chart representation of concentrations of antinutrients (mg/100ml) in cassava from the three different localities.

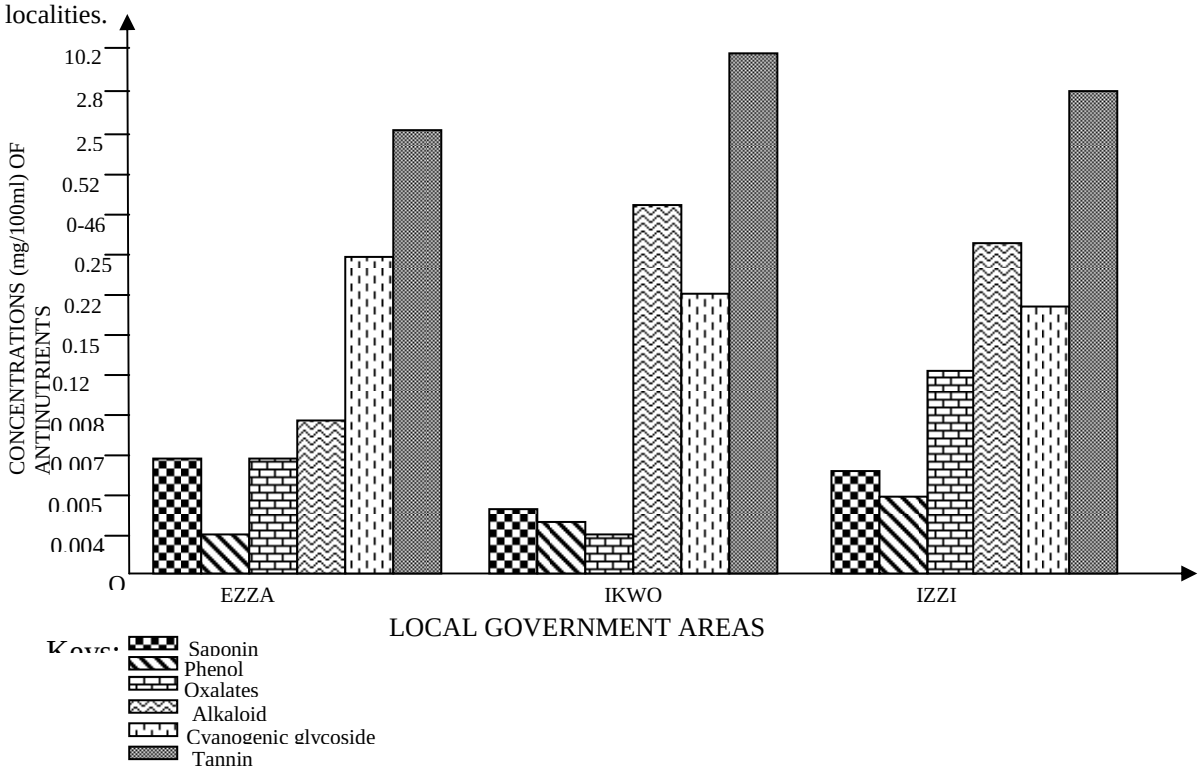

Fig.2: Bar chart representation of concentrations (mg/100ml) of antinutrients in yam from the three different localities.

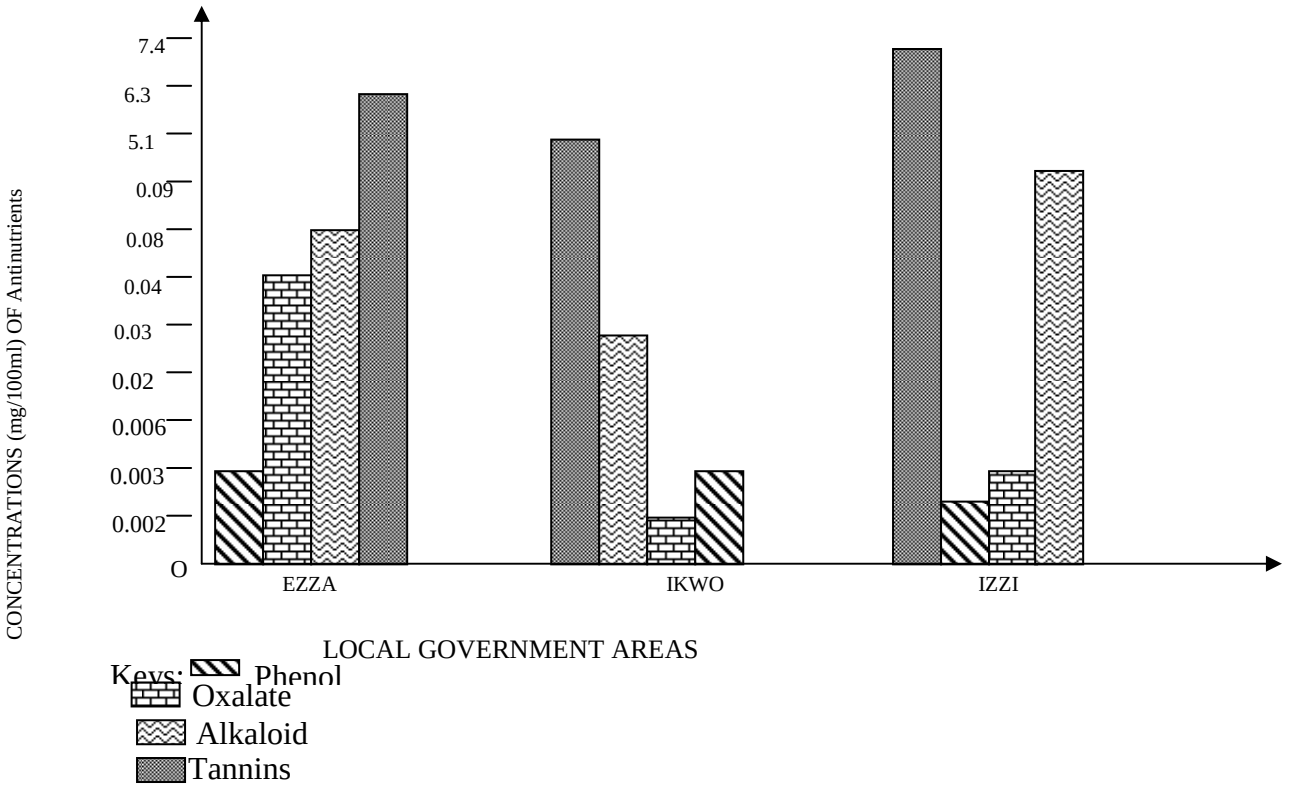

Fig.3: Bar chart representation of concentrations (mg/100ml) of antinutrients in potatoes from the three different areas.

DISCUSSION

The antinutrients levels in staple food crops (cassava, yam and potato) from Izzi, Ezza and Ikwo of Ebonyi State were investigated using titrimetric and spectrophotometric methods. The results revealed that some food crops contained high amounts of antinutrients compared to others while the levels of antinutrients in some were very minute. Osagie (1998) reported that simple boiling, cooking and soaking can reduce the concentration of antinutrients in food stuffs. The cassava from Ikwo recorded relatively high level of saponins with low levels of tannins, phenols, oxalates and cyanogenic glycosides; the cassava from Ezza was highest in the levels of tannins, phenols and alkaloids; while the cassava from Izzi had the highest concentrations of oxalates and cyanogenic glycosides.

The yam from Ikwo recorded substantially very high levels of tannin with lowest levels of saponins and phenols while Izzi yam recorded lowest concentrations of oxalates, alkaloids and cyanogenic glycosides and Ezza yam had the highest levels of oxalates, alkaloids and cyanogenic glycosides .The potatoes from the three areas showed absence of saponins and cyanogenic glycosides with very high concentrations of tannins, phenols and alkaloids in sample from Izzi. The food sample from Ikwo recorded highest concentration of oxalates with relatively minimal levels of other antinutrients.

The disparity in the concentrations of these antinutrients from these areas may be ascribed to the soil factors like pH of the soil or other environmental influences in the different areas in Ebonyi State (Oke, 2002). Climatic and edaphic factors like temperature, moisture content, soil pH, mineral constituents and other factors could affect the levels of antinutrients (Eka, 1985). However, there appeared to be some trace amounts of virtually all the antinutrients in all the food samples from the three different areas except the potatoes. The results showed area-dependent varying concentrations of the antinutrients.

Data collected were subjected to analysis of variance (ANOVA) and antinutrients in these staple foods increased in the following order: Saponins; Yam > cassava, while for Tannins: Potato > Yam > Cassava, Phenols: Yam > Potato > Cassava, while for Oxalates: Yam > Cassava > Potato. Similarly, Alkaloids: Potato > Yam > Cassava,

while for Cyanogenic glycosides: Yam > Cassava. In conclusion the comparative analysis carried out on yam, cassava and potatoes obtained from Izzi, Ezza and Ikwo Local Government Areas of Ebonyi State showed substantial variations in the antinutrients levels.

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Correspondence author:
Nweke, F. N.,
Department of Biochemistry/Biotechnology, Ebonyi State University, Abakaliki
Email: fridaynwalo@yahoo.com